present at the point of collection. For example, the gross alpha activity of samples containing ^{226}Ra will increase following the preparation with the count stabilizing at 400% of the actual ^{226}Ra activity 3–4 weeks after preparation.[1] In contrast, delaying the analysis of the sample for more than two weeks after collection will lead to a failure to detect ^{224}Ra or its decay progeny that were present at the time of collection. Finally, the method is not applicable for the determination of analytes that are volatile under the conditions of analysis. This would potentially impact ^{210}Po.

Finally, Method 900.0 is designed for low-solids samples such as drinking water. This is because alpha and beta particles are severely attenuated by matter they encounter as they travel to the detector (including "self-absorption" by the solids in the sample test source). The amount of solids in a sample limits the size of sample that can be processed and thereby the sensitivity of the measurement. Method 900.0 restricts residue thickness for gross alpha measurements to a maximum of 5 mg/cm^2. In a 50-mm diameter stainless-steel planchet, this is equivalent to 100 milligrams of solid residue. While this method is applicable to drinking water samples which generally have solids content under 500 mg/L, FPWHFO samples may have solids content in the hundreds of thousands of mg/L and sample sizes would be restricted to a small fraction of a milliliter. Since the sensitivity of the measurement is inversely proportional to the size of sample processed, the capability of the method to detect activity could be decreased by a factor of a one-thousand and the ability of the evaporation approach to detect radioactivity in FPWHFO becomes questionable at best.

One approach to addressing this limitation would involve using a measurement technique that is not sensitive to the solids content of the sample being analyzed. Gamma spectrometry, for example, is capable of determining isotope specific gamma-ray emissions from samples of 3 - 5 kg or larger. Unfortunately, this technique is not as sensitive as techniques such gas-flow proportional counting (GPC) or liquid scintillation counting (LSC). Gamma spectrometry cannot detect pure alpha and beta emitters, of which there are several of concern for FPWHFO samples. Liquid scintillation spectrometry is a technique that is capable of sensitive measurements of alpha and beta particle emissions and can tolerate somewhat larger amounts of solids (up to about ½ gram in the sample test source) than can GPC.

A second approach can be taken to improve the sensitivity of gross alpha and gross beta measurements. This involves developing chemical separation methods to remove non-radioactive constituents from the sample thereby allowing the radioactive constituents to be concentrated into a source that can be measured using a method sensitive to alpha and beta particle emissions (e.g., gas-flow-proportional counting or liquid scintillation spectrometry). Method 900.0 relies on evaporation to accomplish this. Water, which is not in itself radioactive, is removed from the sample by evaporation. For this reason, Method 900.0 is limited to determining non-volatile constituents in samples.[2]

[1] This is due to ingrowth of short-lived alpha-emitting decay progeny ^{222}Rn, ^{218}Po, and ^{214}Po. Similar effects are noted with beta-emitting decay progeny of ^{226}Ra, ^{224}Ra, ^{238}U, and ^{210}Pb with time frames ranging from days to months.

[2] This raises questions about whether Po can be reliably determined using method 900.0.